



INSIDER

Newsletter for the Employees of Ames Laboratory ■ Volume 16, Number 2 ■ February 2005

Ames High Wins 2005 Science Bowl

Hometown team takes all 10 of its matches

Performing like they compete in quiz bowls every day of their lives, the talented members of the Ames High School team breezed through all ten of their matches to capture first-place honors in the Ames Laboratory/ISU Science Bowl, Jan. 29. Ames defeated Central Academy of Des Moines 78-16 in the championship match, earning the right to represent the Iowa Region in the Department of Energy's National Science Bowl, April 29-May 3 in Washington, D.C.

This year's win is the sixth for Ames High in the 15 years since the Science Bowl began. The school won the competition three years in a row – 1994-1996 – and again in 2000 and 2001. The Ames High team sailed through its five morning matches, winning by an average margin of 130 points.

In the double-elimination afternoon rounds, Ames beat Humboldt, Urbandale, and Dubuque Hempstead, and then trounced Cedar Falls 90-48, sending that school to the consolation bracket and a rematch with Central Academy. The Des Moines team won the match with ease, 106-20, only to meet disaster in the following championship match with Ames. Dubuque Hempstead was the other quarterfinalist.

The 2005 Science Bowl hosted 47 student teams from across Iowa. The daylong event saw students tackling a variety of science and math questions in a quiz-bowl format that included both toss-up and bonus questions. The teams competed in round-robin flights during the morning, with the top two teams from each of the eight flights advancing to the afternoon "Sweet 16" double elimination.

Staging the hugely popular science competition was made possible by overwhelming volunteer support from both the Ames Lab and Iowa State communities. Approximately 100 individuals took part in the event, serving in the roles of moderator, judge, timekeeper and scorekeeper. Several of these volunteers also took on extra responsibilities, helping Science Bowl organizers pack, load and unload equipment and set up 18 competition rooms in the Memorial Union on the evening before the event.

In addition to outstanding volunteer support, the Science Bowl receives much-appreciated financial backing from some terrific sponsors: Rockwell Collins, 3M, HyVee, Pella, Hach, and, of course, Iowa State University and Ames Laboratory. Their generous contributions help provide an avenue for talented students who excel



It's trophies all the way around for students on the Ames High team after capturing the 2005 Ames Lab/ISU Science Bowl championship. Clockwise, from far left are: coach Kirk Daddow, Chuck Cleary, Joshua Moloney, Ames Lab Director Tom Barton, Gan Qi, Neal Marasinghe and Pan Xin.

in math and science, like those on the successful Ames team, to demonstrate their academic skills.

With the regional competition behind them, the members of the Ames High winning team – Neal Marasinghe, Gan Qi, Chuck Cleary, Joshua Moloney and Pan Xin – will be preparing to face off against winners of the other 65 regional competitions nationwide when they meet at the National Science Bowl in Washington, D.C., at the end of April.

The coach of the Ames High team, Kirk Daddow, notes that the opportunity to attend Nationals is particularly sweet for Marasinghe, who was a freshman member of the Ames team that finished second in the 2002 regional competition. "Neal's our four-year starter," says Daddow, "so it was nice for him to finally get a championship." ■ *more photos on page 4*

~ Saren Johnston

MFRC Gets Federal Funding

Harkin announces \$1.5 million for forensics center

Iowa Senator Tom Harkin has announced \$1.5 million in federal funding for Ames Laboratory's Midwest Forensics Resource Center.

"This support further recognizes that we have developed a positive program for Iowa and the Midwest and for the people we serve," says David Baldwin, director of the MFRC.

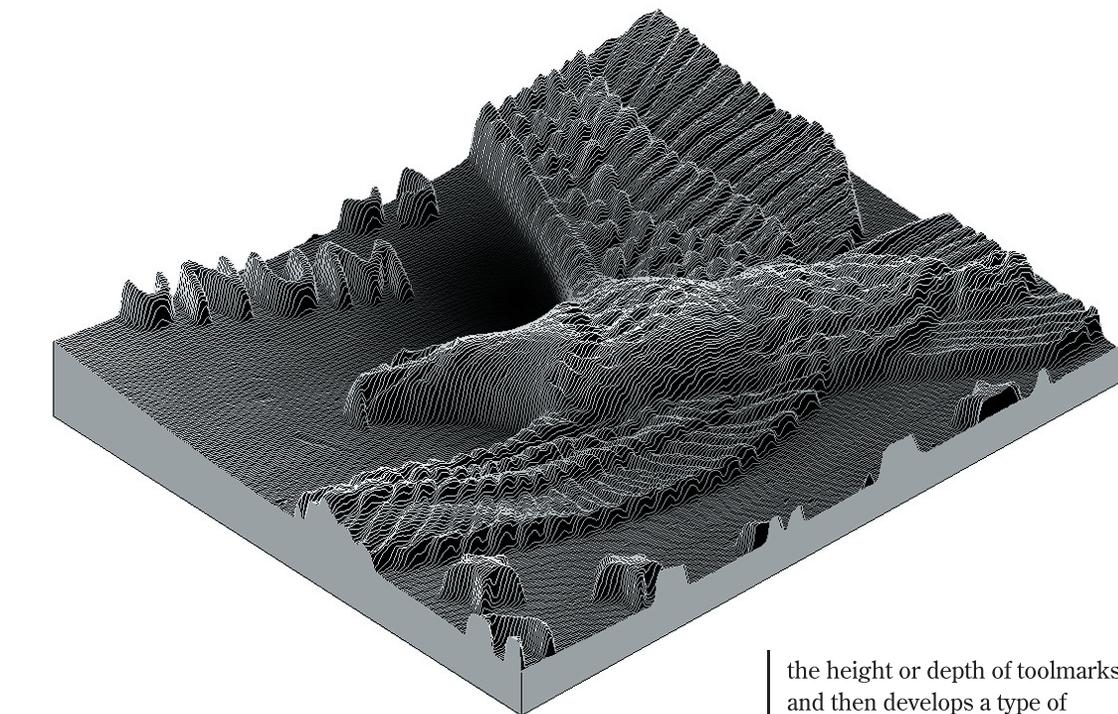
The MFRC partners include crime laboratories in 10 Midwestern states, including North Dakota, South Dakota, Nebraska, Kansas, Missouri, Minnesota, Wisconsin, Illinois, Indiana and Iowa.

In addition to its regional partners, the MFRC works with federal agencies that support forensic efforts. These agencies include the FBI; the Bureau of Alcohol, Tobacco, Firearms and Explosives; the Department of Energy; and the Department of Justice.

The MFRC has a five-part mission. The first part is to conduct short-term, case-related forensic projects for the center's regional partners. "Through our casework assistance program, we make available to our partners experts and instrumentation that they don't have in their own crime labs," says Baldwin.

The MFRC also develops new training programs for its partners. Some of the training the center has provided in the past includes analysis of arson debris and glass-fragment analysis. The center is currently exploring work with an expert at the Des Moines Police Department and the Virtual Reality Applications Center at ISU to develop animation to teach law-enforcement personnel the best ways to collect blood-spatter evidence at crime scenes and what kinds of evidence can be created during a violent crime.

In addition to casework analysis and training programs, the MFRC is working to foster a collaboration of forensic science educators at colleges and universities around



This image of an American eagle on a Sacagawea dollar resulted from a scan by a profilometer. The scan is used to create a contour map that illustrates the detail and resolution that can be produced by the instrument.

the region. The goal is to create an organization that works to develop improved curricula and student experiences through shared programs and resources.

A fourth part of the MFRC mission is development of technical innovations in management and infrastructure, or TIMI. TIMI looks at how information, engineering and communication technologies can be implemented in crime laboratories to make the labs work more efficiently with existing resources.

A TIMI project will evaluate the use of Radio Frequency Identification tagging, or RFID, in crime laboratories for evidence management. In particular, the project will focus on process management in a section, such as a DNA laboratory, where forensics experts need to know how long samples need to stay at certain stages and make sure they don't go to the wrong department at the wrong time. "Using RFID tagging, you can track where evidence is supposed to be on a day-by-day basis and

whose handled it," says Baldwin. "This is critically important."

The final part of the MFRC mission is research. The center currently has 16 research proposals under review. One project that was previously funded by the MFRC and now is a recipient of external funding is research being conducted by Scott Chumbley, an Ames Laboratory metallurgist and ISU professor of materials science and engineering. Chumbley and co-principal investigator Larry Genalo are using 3-D characterization methods and statistical methods to identify toolmarks.

Toolmarks can best be explained as the individual imprints, fingerprints, that tools leave on surfaces with which they come in contact. For example, a screwdriver used to jimmy a door at a crime scene will leave a toolmark on the door jamb. Forensic experts use these unique marks as evidence to match crimes to criminals.

Using a device called a profilometer, a scanning tool that measures

the height or depth of toolmarks and then develops a type of contour map of the marks from the scan, Chumbley can precisely characterize a toolmark. "Preliminary results show the instrument is accurate to within plus or minus 0.2 microns in measuring surface topography," says Chumbley. This work began with support from the MFRC, but in fall 2004 Chumbley received an additional \$390,000 from the National Institute of Justice, a division of the Department of Justice, to continue his research.

With three years of experience under MFRC's belt, Baldwin says the next step for the center is to convince the federal government the MFRC can provide valuable services not found elsewhere. "We hope they will see the value in our regional model for how to distribute rare resources geographically around the United States," Baldwin says. What he would ultimately like to see is federal funding for a half-dozen centers nationwide that are outlets for federally funded research, for resources the government wants to make available, and for the development of collaborative products. ■

~ Steve Karsjen



Ames Lab Research on Magazine Cover

A technical drawing by Janice Weedman, graphic designer, was selected for the cover of the Feb. 7, 2005 issue of *Inorganic Chemistry*. Weedman created the drawing titled “Reactions that Evolve Hydrogen from Solutions” from pencil sketches developed by Yang Cai. Cai is a Ph.D. student working with senior chemist James Espenson.

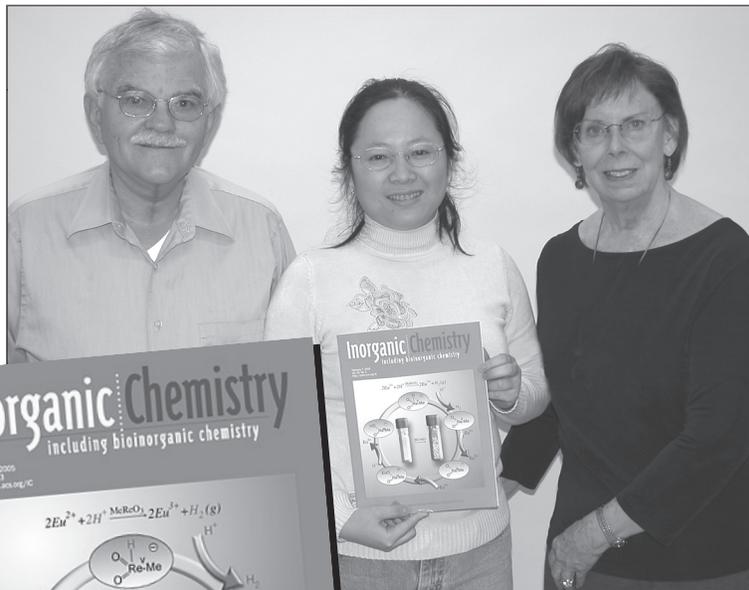
The research by Cai and Espenson addresses the question of hydrogen evolution from acidic solutions of metal ions that have negative standard reduction potentials.

Espenson explains the research as follows: Thermodynamic analysis indicates that metal ions such as europium(II) and chromium(II) will evolve molecular hydrogen in solutions containing acid. In spite of the thermodynamics, these reactions do not occur in practice at any measurable rate: that is to say, there is a large kinetic barrier to be overcome. In such circumstances, the reaction can possibly be brought about with the aid of a catalyst, a substance that enters the reaction cycle but ultimately emerges unchanged.

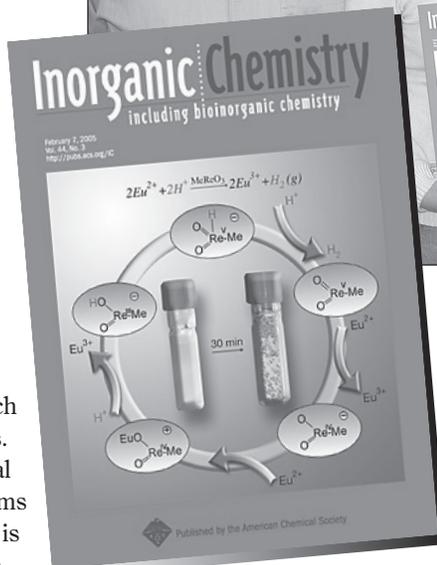
It was discovered that methyltrioxorhenium, ReMeO_3 , catalyzes hydrogen evolution for the reaction of Eu^{2+} , but not for Cr^{2+} , despite their nearly identical thermodynamics. The objective of the research was to learn how the molecules and ions involved give these results.

The europium reaction was studied in detail by means of chemical reaction kinetics, revealing a multistep process characterized in terms of the chemical species involved. The step at which H_2 is produced is the last; it utilizes a rhenium hydride and can be represented by the chemical equation $\text{HReMeO}_2^- + \text{H}^+ \rightarrow \text{ReMeO}_2 + \text{H}_2$.

Equally important, the question naturally arose as to why Cr^{2+} does not react analogously. The catalytic scheme becomes frozen midway for



*Jim Espenson, Yang Cai, and Jan Weedman pose with the Feb. 7, 2005 issue of *Inorganic Chemistry* that features Ames Laboratory research on the cover.*



Cr, however, because it was discovered that the substance first formed has an electronic configuration that forbids Re and Cr from separating. Thus they cannot react further, and no hydrogen is produced. ■



Annual Blood Pressure Clinic

Eric Barada, IPRT Public Affairs journalism intern, gets his blood pressure checked by Audrey Hohanshelt, nursing supervisor, during the Feb. 15 free blood pressure clinic offered by Occupational Medicine. Not surprisingly, Barada’s blood pressure was on the excellent side of normal – a good thing since the Airforce ROTC cadet will enter flight school in late summer, and high blood pressure would ground him for sure. Normal blood pressure is usually said to be 120/80 (systolic/diastolic) or less. The higher (systolic) number represents the pressure while the heart is beating. The lower (diastolic) number represents the pressure when the heart is resting between beats.

Service with a Smile — for 25 Years



Ellen Price

Ames Lab employees, **Ellen Price**, account specialist, and **Mike Dotzler**, facilities mechanic, were honored February 17 at a special banquet in the Scheman Building to welcome new members to Iowa State University’s 25-Year Club.

The club was formally established in 1934 under the direction of the late Colonel Harold E.

Pride, then secretary of the Iowa State Alumni Association. The purpose of the club is to recognize men and women who have loyally served Iowa State for 25 years or more.

As Colonel Pride wrote to the charter members: “Staff members who have served the College as long as you have, come to personify the College to her alumni. Buildings and land do not make a college. It is the men and women of the staff who make any college. ...” ■

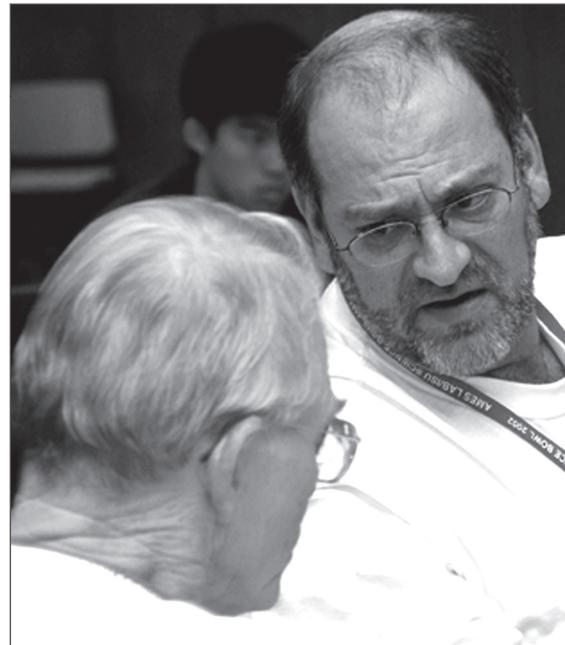


Mike Dotzler

Ames High wins 2005 Science Bowl *continued from page 1*



Members of the Boone team congratulate Hempstead players on winning the match.



So what do you think of that answer?" Novice Science Bowl volunteer Alan Goldman (right) seeks input from veteran volunteer Tom Barton concerning a player's response to a tossup question.

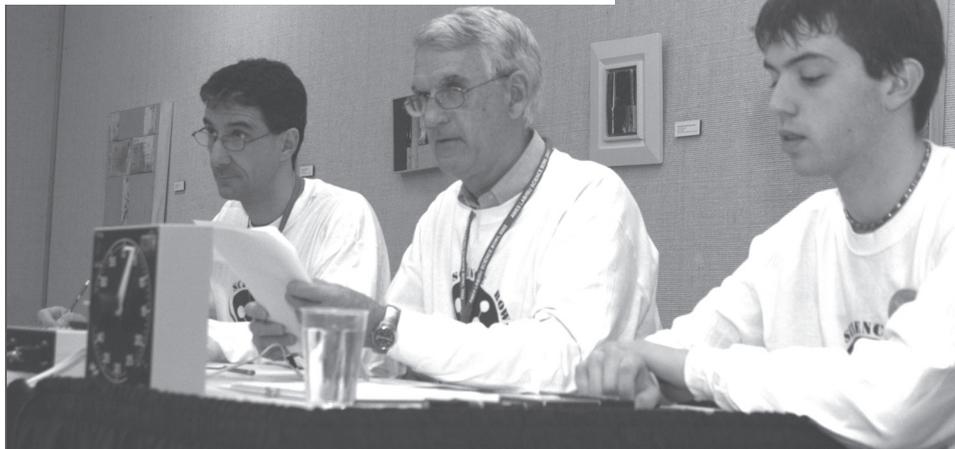
(right) Tension is running high as Stephanie Schulze, Central Academy, ponders the answer to a tossup question.



(below) Nick Ruhler, Dubuque Hempstead, grimaces, showing his distaste for yet another lengthy and complex math question.



Ames High students Gan Qi (left) and Neal Marasinghe furiously calculate the answer to a bonus question during the championship match.



Individuals from all parts of the campus community volunteer for Science Bowl. From left: Kevin Dennis (judge), Ames Lab; Donald Lewis (moderator), Entomology; and Eric Wilson (timekeeper), ISU pre-med freshman. Not pictured is Anne Stockdale (scorekeeper), ISU materials engineering freshman. Wilson and Stockdale participated in Science Bowl as high school students.

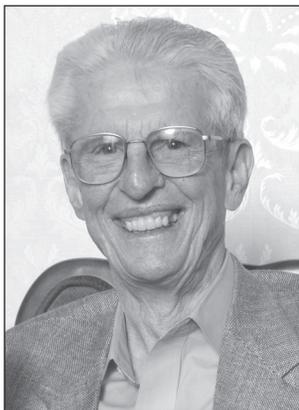
Corbett to Receive Rare Earth Research Conference's Spedding Award

Ames Laboratory senior chemist John Corbett has been named the recipient of the 2005 Spedding Award, the top honor for researchers in the field of rare-earth science and named for the first director of Ames Laboratory.

Corbett, who is also a Distinguished Professor of Chemistry in the College of Liberal Arts and Sciences at Iowa State University, is the 11th recipient of the Spedding Award, which is given annually by the Rare Earth Research Conference. The award is given in recognition of excellence and achievement in research centered on the science and technology of rare earths and consists of a medal mounted on a plaque and a prize of \$1,000, sponsored by Bracco Research USA Inc.

The award will be presented to Corbett at the 24th Rare Earth Research Conference, June 26-30, in Keystone, Colo. During the conference, Corbett will present an awards lecture on his many years of work with reduced rare-earth metal compounds.

Corbett is the second Ames Lab researcher to receive the Spedding Award. Senior metallurgist Karl A. Gschneidner was the first Ames Lab



John Corbett

recipient and the sixth winner overall.

The Spedding Award is named in honor of Frank Spedding, a longtime Iowa State chemistry professor and one of the nation's leading atomic scientists. Spedding was a pioneer researcher with rare earths and organized and directed the chemistry phase at Iowa State of the historic Manhattan Project. He founded the Institute for Atomic Research and the Ames Laboratory of the U.S. Atomic Energy Commission.

A member of the National Academy of Sciences, Corbett has been an Ames Laboratory researcher and a faculty member in Iowa State's chemistry department since 1952. During that time, he has served as chair of the department and as a division chief and program director in the Ames Laboratory.

Corbett's research interests revolve around inorganic solid-state chemistry, emphasizing strong metal-metal bonding. He has received both awards in inorganic chemistry given by the American Chemical Society, including the Award for Distinguished Service in the Advancement of Inorganic Chemistry.

He is a fellow of the American Association for the Advancement of Science and has received a Senior Scientist Award from the Humboldt Foundation and two DOE awards for Outstanding Scientific Accomplishments and Sustained Research in Materials Chemistry. ■

~ Kerry Gibson

Bodman Confirmed as Secretary of Energy

Samuel W. Bodman was confirmed as Secretary of Energy by unanimous consent of the U.S. Senate on Jan. 26. Secretary Bodman was recently the Deputy Secretary of the Department of Treasury. He had previously served as Deputy Secretary of the Department of Commerce, beginning in 2001.

Secretary Bodman is a financier and executive by trade, with three decades of experience in the private sector. He is an engineer by training, with a B.S. in chemical engineering from Cornell University and an ScD, or doctor of sci-

ence, from the Massachusetts Institute of Technology. He had specific oversight over the national Oceanic and Atmospheric Administration, the Patent and Trademark Office, and the National Institute of Standards and Technology while at the Department of Commerce. ■



Sam Bodman



Student Travels Back in Time

Larry Jones, director of the Materials Preparation Center, uses old photos from the Manhattan Project years to introduce Nate Ryan, an eighth-grader from Gilbert, and his father, Steve Ryan, to the uranium production work that took place at Iowa State between 1942 and 1945. The youngster had requested a tour of the Lab to get more background information for his school project on nuclear power. During the visit, he saw the historical display in TASF, the Army/Navy E Flag in Spedding and the many photos of the uranium production process adorning the walls in the second-floor hallway of Wilhelm.

Gilman Lecture will be March 22

The Gilman Lecture will be Tuesday, March 22, at 8:00 p.m. in 1414 Molecular Biology. The speaker will be Dr. Larry Overman, distinguished professor of chemistry at the University of California, Irvine.

Professor Overman's research interests center on the invention of new reactions and strategies in organic synthesis and the total synthesis of natural products and their congeners. ■

CNDE Research Hot Topic for Industry

A new way of looking inside of things using “phased array ultrasonic testing” will allow maintenance and manufacture of critical metal parts to be more efficient. PAUT is an emerging technology in the heavy equipment and aerospace industry. On the cutting edge of this technology is Jon Friedl, a Ph.D. graduate student researching at the Center for Nondestructive Evaluation.

Most people think of regular ultrasonic testing as little different from PAUT. UT and PAUT both use high frequency sound waves to find flaws in materials. A transducer generates a sound pulse that penetrates the material; the wave hits a defect and returns to the same or another transducer, which is displayed graphically. UT utilizes individual transducers, each having fixed parameters in terms of focal depth and angle of inspection. PAUT breaks a traditional transducer into multiple elements controlled by individual electronics, allowing the material to be scanned for flaws at any focal depth or angle of inspection within its operating range. PAUT can be thought of as multiple UT elements working in concert.

The medical field has used PAUT for decades. However, due to the larger velocity jumps at the types of interfaces encountered in nondestructive evaluation, resulting in large refraction and/or spurious reflections as well as near surface resolution issues, researchers have struggled to develop a practical PAUT tool. Until now.

Friedl and his NDE colleagues, including, R. Bruce Thompson, Tim Gray, and Ron Roberts, are among the most knowledgeable researchers in the world about this technology. “I have been rather alone in it, but on the other hand that’s a great thing because anything I do goes into my dissertation as unique work, I’m in an excellent position,” says Friedl.

He is working closely with Pratt and Whitney, Honeywell, Caterpillar and General Electric. Friedl believes that using phased arrays will increase safety, save costs and increase throughput for companies investing in the technology. A promising application of this technology is in the aerospace industry. Jet turbine discs require inspection at each stage of their manufacture and regular inspection for surface defects while in service. The flexibility of PAUT is being studied in an effort to increase manufacturing throughput as well as reduce out-of-service time for aircraft undergoing maintenance.



Jon Friedl is researching PAUT, an emerging nondestructive evaluation technique.

Currently, Friedl is researching PAUT’s ability to inspect jet turbine engine disks through their curved entry surfaces by compensating already-in-use phased arrays with mirrors. This approach will allow for a greater range of use with this technology.

IPRT, ISU Featured on WHO Radio

Joe Gilbert, IPRT associate director, was among the Iowa State University guests of the “Mickelson in the Morning” talk radio show on December 9, 2004. Host Jan Mickelson led a discussion of ISU’s economic development efforts in the state of Iowa. The show runs daily on weekdays from 9:00 a.m. to 11:30 a.m. on WHO Radio, a 50,000-watt Clear Channel station that reaches all of Iowa and a good portion of the surrounding states. Gilbert helped arrange for representatives from ISU’s economic development efforts to be featured on the show, which took a break from its usual topic of politics.

Other guests from ISU included Jim Bloedel, vice provost for research; Lisa Lorenzen, director of industry relations; and Steve Carter, director of the ISU Research Park and of the ISU Pappajohn Center for Entrepreneurship; and Tim Borich, associate dean in the College of Design. The show also featured founders of two Iowa start-up companies assisted by IPRT and ISU: Charles Link of NewLink Genetics and Doug Jacobson, an ISU professor of electrical and computer engineering and founder of Palisade Systems.

Gilbert gave an overview of the technical assistance provided by IPRT to Iowa companies. He also provided examples of successful assistance projects carried out by IPRT for companies needing help with materials, quality, and other technical and manufacturing problems. Gilbert and Bloedel also explained how intellectual property rights work in company assistance projects.

To Mickelson's question, "Is this a good thing?," Gilbert responded by explaining how IPRT's expenditure of \$483,000 in the last fiscal year for contract research was leveraged into \$1.6 million worth of research through company contributions. IPRT surveyed the companies and asked what the research meant to the company in terms of job creation and retention, sales and investments. "That \$1.6 million in research activity equates to approximately 100 jobs created or retained and \$10 million into the economy," Gilbert told the audience.

VRAC's VR Software Runs on Apple

Apple, the computer maker, is now a provider of virtual reality, thanks to the efforts of Carolina Cruz-Neira, associate director of IPRT's Virtual Reality Applications Center and the Stanley Chair in Interdisciplinary Engineering at Iowa State University. VR Juggler, an open source virtual reality application development framework produced by Cruz-Neira's group at VRAC, now works with Apple's OSX operating system. Collaborators include Apple's Stan Ethington, Infiscape's Patrick Hartling, and VRAC's Aron Bierbaum, Jonathan Gurley and Jeff Russell.

VR Juggler speeds development of virtual reality applications by hiding hardware and operating systems details. Apple's OSX joins Windows, Linux and Unix as VR Juggler-supported platforms. Existing VR Juggler applications developed for other platforms can now run in OSX with no need for porting.

VR Juggler provides developers with a suite of application programming interfaces that abstract and simplify interface aspects, including display surfaces, object tracking, selection and navigation, graphics rendering engines and graphical user interfaces. An application written with VR Juggler is essentially independent of devices, computer platforms and VR systems. It supports many configurations, including desktop VR, head-mounted displays, CAVE™-like devices and Powerwall™-like devices. VR Juggler is used in over 300 sites worldwide. For more information, visit the VR Juggler Web site at www.vrjuggler.com.

Congratulations on 25 years!

These IPRT employees are new members of Iowa State University's 25-Year Club.



Glenn Norton, Center For Sustainable Environmental Technologies



Bethany Hageman, Virtual Reality Application Center



Frank Margetan, Center for Nondestructive Evaluation

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World Year of Physics Family Fun

Paul Canfield, senior physicist and an ISU professor of physics and astronomy will present "Big Chills and Hot Flashes: the Physics of Cold and Hot" at the Ames Public Library, 515 Douglas Ave., Saturday, March 26, from 1:30-2:30 p.m. Don't miss this dynamic presentation that's full of "don't-try-this-at-home" demos.

Shape Up in the Bodyshop

Occupational Medicine's Exercise Class, "The Bodyshop," continues to be offered every Monday and Thursday from 12:00 to 12:30 p.m. in Room 205 TASF. Call Vickie Hahn at 294-6837 for details.



Thanks from The Arc and MICA

The following thank-you notes were received from The Arc of Story County and Mid-Iowa Community Action for the donations received from Ames Lab and IPRT through the annual holiday auction.

From Laurie Ertz at The Arc: "What a wonderful holiday gift! Thank you so much for thinking of The Arc and making all the arrangements that enabled us to be the beneficiary of your annual holiday auction. Many wishes for a healthy, happy, peaceful New Year!"

From Shelly Dilks at MICA: "Mid-Iowa Community Action, Inc. wishes to thank you for your donation of food in December. MICA served 165 families in need of food assistance in December alone. There has been a continuing increase in the need for food assistance and emergency services all year long. The community has been very generous in responding to the demand. We truly appreciate your helping families in the Story County community and want to express our gratitude. Together we can make a difference."

Middle School Science Bowl

Volunteers are needed to fill the roles of moderator, judge, timekeeper and scorekeeper for the Ames Laboratory/ISU Middle School Science Bowl, Sat., April 9. Please contact Saren Johnston, 4-3474 or sarenj@ameslab.gov, to volunteer for this exciting event.

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Editor Saren Johnston
Layout Kerry Gibson

Address comments to:

Editor, *INSIDER*
111 TASF
Ames, IA 50011-3020
515/294-9557
FAX 515/294-3226

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